



Atmosphere and ocean dynamics; contributions to the European "Little Ice Age"?

V. Palastanga (1), G. van der Schrier (1), T. Kleinen (2), **S.L. Weber** (1), T. Osborn (2), K.R. Briffa (2)

(1) Royal Netherlands Meteorological Institute, (2) Climatic Research Unit, University of East Anglia

This presentation will review model-based evidence that processes internal to the climate system may explain changes in European climate during the so-called "Little Ice Age". Two hypotheses have been put forward in this respect; one relates it to a reduction in the Meridional Overturning Circulation (MOC), the other relates it to a change in the atmospheric circulation with a persistently negative North Atlantic Oscillation Index (NAOi).

In simulations of the HadCM3 GCM and the intermediate complexity GCM ECBilt-Clio, we reduce the strength of the MOC with ca. 25% of that of the control simulation. Both models show a cooling over the North Atlantic sector related to the decrease of the MOC, and also show an additional effect on the atmospheric circulation. The change in the atmospheric circulation resembles a negative NAOi-type circulation and advects frigid sub-polar air masses into Europe, providing an additional cooling.

Using recently developed assimilation techniques, simulations with the HadCM3 and ECBilt models are made which show a persistently negative NAOi circulation in the winter season. The climates of these simulations have many similarities with reconstructions of the European Little Ice Age climate.

Based on these simulations, a distinction between the two hypothesis on the coldness of the Little Ice Age is difficult, pointing at the pressing need for constraints from marine climate reconstructions.